

CLAIMS

1. A system for breath analysis comprising:

providing a breath sample;

providing an asymmetric field ion mobility spectrometer comprising:

an ionization source for ionizing the breath sample and creating ions;

an analytical gap enclosed by a housing;

an ion filter disposed in the analytical gap downstream from the ionization source, and including electrodes on an inside surface of the housing for creating an asymmetric electric field to filter the ions;

an ion flow generator including electrodes proximate but insulated with respect to the ion filter electrodes for creating an electric field transverse to the asymmetric electric field for propelling ions through the asymmetric electric field; and

an ion detector for sensing ions not filtered by the ion filter.

2. The system of claim 1 wherein providing a breath sample comprises:

providing a constant rate of breath expiration.

3. The system of claim 1 further comprising:

introducing the breath sample into the spectrometer.

4. The system of claim 3 wherein the breath sample is introduced at a constant rate.
5. The system of claim 3 wherein a fixed volume of the breath sample is introduced into the spectrometer.
6. The system of claim 3 further comprising a pressure source for introducing the breath sample into the spectrometer.
7. The system of claim 3 wherein the breath sample is exhaled into the spectrometer.
8. The system of claim 7 further comprising:
 - providing a channel adapted to introduce the exhaled breath sample into the spectrometer.
9. The system of claim 8 wherein the channel comprises a mouthpiece.
10. The system of claim 3 wherein the breath sample is contained in a collection vessel.
11. The system of claim 10 further comprising:

providing a conduit adapted to introduce the breath sample contained in the collection vessel into the spectrometer.

12. The system of claim 1 wherein providing a breath sample comprises:

providing a signal to a user that the breath sample rate is constant.

13. The system of claim 1 further comprising providing intermediate analytical separation of the breath sample prior to introducing the breath sample to the spectrometer.

14. The system of claim 1 wherein providing a breath sample comprises:

breathing according to a standard protocol prior to providing the breath sample.

15. The system of claim 1 wherein the breath sample is taken from a patient suspected to have at least pulmonary infection, metabolic disease, chronic progressive degenerative pulmonary disease, lung cancer, or organ dysfunction.

16. The system of claim 1 wherein the breath sample is taken from a patient receiving a course of drug therapy.

17. The system of claim 1 wherein the breath sample is taken from a patient suspected to have been exposed to industrial chemicals.

18. The system of claim 1 wherein the ion detector is adapted to sense ions indicative of nitric oxide level.

19. The system of claim 1 wherein the ion detector is adapted to sense ions indicative of at least pulmonary infection, pulmonary inflammation, metabolic disease, chronic progressive degenerative pulmonary disease, lung cancer, organ dysfunction, or industrial chemical exposure.

20. The system of claim 1 wherein the ion detector is adapted to sense ions of biomarkers indicative of response to drug therapy.

21. The system of claim 1 wherein the ion detector is adapted to sense ions indicative of at least bacterial infection, viral infection, fungal infection, yeast infection, infectious disease agents, response to biowarfare agents, or emerging infectious disease agents.

22. The system of claim 1 wherein the spectrometer is hand held.

23. The system of claim 1 wherein the spectrometer is adapted to have an independent power supply.

24. The system of claim 1 wherein the spectrometer is adapted to be fieldable.

25. The system of claim 1 further comprising:

providing a data collector to collect the ion sensed by the ion detector; and
evaluating the collected data for a pattern.

26. The system of claim 25 wherein the data collector is a personal data assistant.

27. The system of claim 25 wherein the data collector is disposed on the housing of the spectrometer.

28. An asymmetric field ion mobility spectrometer for breath analysis comprising:

an ionization source for ionizing a breath sample and creating ions;

an analytical gap enclosed by a housing;

an ion filter disposed in the analytical gap downstream from the ionization source, and including electrodes on an inside surface of the housing for creating an asymmetric electric field to filter the ions;

an ion flow generator including electrodes proximate but insulated with respect to the ion filter electrodes for creating an electric field transverse to the asymmetric electric field for propelling ions through the asymmetric electric field;
and

an ion detector for sensing ions not filtered by the ion filter.

29. An asymmetric field ion mobility spectrometer for breath analysis comprising:

an ionization source for ionizing a breath sample and creating ions;

an analytical gap;

an ion filter disposed in the analytical gap downstream from the ionization source, and including a pair of spaced electrodes for creating an asymmetric electric field to filter the ions;

an ion flow generator including a plurality of spaced discrete electrodes insulated from the pair of spaced electrodes for creating an electric field transverse to the asymmetric electric field for propelling ions through the asymmetric electric field; and

an ion detector for sensing ions not filtered by the ion filter.

30. An asymmetric field ion mobility apparatus for identification of ion species in a breath sample, the apparatus comprising:

an ionization source for ionizing a breath sample and creating ions;

an ion filter disposed in a flow path, said flow path having a longitudinal axis for the flow of ions, said filter supplying an asymmetric filter field transverse to said longitudinal axis, said asymmetric filter field being compensated;

an ion flow generator for longitudinally propelling ions along said flow path in said compensated asymmetric filter field; and

the ion filter passing a species of said propelled ions, said species having a set of characteristics correlated with said compensated asymmetric filter field, said correlation facilitating identification of said species.